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CLAIMS

[Claim(s)]

[Claim 1] It is the computing system which has the storage system connected with the first computer, the second computer, and said first computer and said second computer. Said first computer Said second computer is provided with the storage region which said storage system has as an imagination storage region. The instruction to said imagination storage region is received from said second computer. The computing system characterized by choosing and performing whether the instruction corresponding to said instruction is transmitted to said storage system corresponding to said imagination storage region, or processing corresponding to said instruction is performed according to the property of said storage system.

[Claim 2] Said instruction is an instruction which copies said imagination storage region, and with the instruction corresponding to said instruction Are the instruction which makes said storage system corresponding to said imagination storage region copy the storage region which said storage system has to other storage regions, and with the processing corresponding to said instruction The computing system

according to claim 1 characterized by being the processing which reads data from the storage region which said store system corresponding to said imagination storage region has, and transmits data to other storage regions.

[Claim 3] It is the computing system which has the storage system connected with the first computer, the second computer, and said first computer and said second computer. Said first computer Said second computer is provided with the storage region which said storage system has as an imagination storage region. The instruction which copies said imagination storage region from said second computer is received.

[whether according to the property of said storage system, the copy of the storage region which said storage system corresponding to said imagination storage region has is directed to said storage system, and]

The computing system characterized by choosing and performing whether data are written in another storage region which reads data from the storage region which said store system has, and said store system has.

[Claim 4] Said first calculating machine is a computing system according to claim 3 characterized by performing said selection activation means based on the information which has the table which recorded the property of said store system, and was recorded on this table.

[Claim 5] The computing system according to claim 4 characterized by storing the information on whether it has the function in which said store system copies the data stored in this store system on said table inside this store system.

[Claim 6] The computing system indicated by any one of claim 4 characterized by storing in said table the information on whether it has the function in which said store system transmits the data stored in this store system to a different store system from this store system, and

claims 5.

[Claim 7] The computing system according to claim 1 with which said instruction is characterized by being the instruction which writes data in said imagination storage region, for the instruction corresponding to said instruction being an instruction which makes data write in said store system corresponding to said imagination storage region, and the processing corresponding to said instruction being processing which operates said store system as RAID.

[Claim 8] Are the computer connected with the first computer and a storage system, and it has a processor and memory. Said first computer is provided with the storage region which said storage system has as an imagination storage region. The instruction which copies said imagination storage region from said first computer is received.

[whether according to the property of said storage system, the copy of the storage region which said storage system corresponding to said imagination storage region has is directed to said storage system, and]
The computer characterized by choosing and performing whether data are written in another storage region which reads data from the storage region which said store system has, and said store system has.

[Claim 9] The computer according to claim 8 characterized by collecting the information about the property of said storage system to said storage system.

[Claim 10] It is the duplicate approach of the data in the computer system which has the store system connected with the first computer, the second computer, and said first computer and said second computer. It judges whether said first computer is equipped with a means by which said storage system creates the duplicate of the storage region which this storage system has. The duplicate approach of the data characterized by taking out directions of the duplicate of said storage

region to said store system, or reading data from said storage region according to said decision result, and storing in a predetermined storage region, or choosing and performing either.

[Claim 11] It is the computing system which has the storage system connected with the first computer, the second computer, and said first computer and said second computer. Said first computer Said second computer is provided with the storage region which said storage system has as an imagination storage region. [whether according to the property of said storage system, the processing to the storage region which said storage system corresponding to said imagination storage region has is directed to said storage system, and] The computing system characterized by choosing and performing whether processing to the storage region which said storage system has is performed.

[Claim 12] It is the computing system which has the storage system connected with the first computer and said first computer. Said first computer It provides for the second computer by which the storage region which said storage system has is connected to said storage system as an imagination storage region. The instruction to said imagination storage region is received from said second computer. The computing system characterized by choosing and performing whether the instruction corresponding to said instruction is transmitted to said storage system corresponding to said imagination storage region, or processing corresponding to said instruction is performed according to the property of said storage system.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the computing system which deals with the supposed storage region.

[0002]

[Description of the Prior Art] There is much what the data which are equipped with when the data which a computer system has by a certain abnormalities disappear in the computer system which a bank, a securities firm, etc. have, and a computer system has daily are reproduced for (" backup" is called hereafter).

[0003] In JP,2000- 132343,A, a copy of data is created as a way method of backup within the store system which a computer system has (a "snap shot dump" is called hereafter), and the method of backing up data is indicated based on the copied data. Moreover, there is also the technique (a "remote copy" is called below) of creating a copy of data between but [not within a store system] store systems.

[0004] On the other hand, the data used with a computer system become huge, and in order to manage a storage system, the cost which a user pays has been increasing. On the other hand, Investigation Committees Morgan The storage region with which two or more store systems which a system has provide report "Virtualizingthe SAN" (5 July 2000) by Keegan is supposed, a logical memory field ("virtual volume") is created, and the system which reduces the management cost of the store which the user who uses a system pays by providing a user (host computer) with this virtual volume is shown.

[0005]

[Problem(s) to be Solved by the Invention] All kinds of storage system may be connected to the computing system which realizes bar tea RIZESHON mentioned above. That is, the storage system which can

offer neither the snap shot dump mentioned above nor the function called remote copy may be connected. In this case, since the store system which constitutes a part of virtual volume cannot offer functions, such as a snap shot dump, it cannot process a snap shot dump etc. about a virtual entire volume in the computer system which has realized bar tea RIZESHON. Now, in case a computer system performs backup etc., the technique of a snap shot dump etc. cannot be used well.

[0006] The purpose of this invention is offering the computer system which complements the function which a storage system called the duplicate of virtual volume etc. runs short of, and its approach in the computer system with which the storage system which has functions, such as a snap shot dump function, and the storage system which does not have these functions are intermingled.

[0007]

[Means for Solving the Problem] In order to realize the above-mentioned purpose, the computer which offers the storage region supposed in this invention by the computer which a user uses A means to check the existence of the function of the store system connected to the computing system, for example, the function which reproduces data within a store system. It considers as the configuration which has a selection activation means to choose and perform whether activation of the function which a storage system has is directed based on the result of the check, or the function which corresponds for this computer itself is performed. When it is the function of data [in / especially / in the function of a store system / a store system] of a duplicate, the processing which this calculating machine performs is processing which reads the data which should be reproduced from a store system and transmits to the corresponding storage region.

[0008] Moreover, the function which constitutes RAID may be included

in the function of a storage system as a desirable embodiment of this invention. Furthermore, as a desirable gestalt of this invention, in order to check the function of a storage system, you may have a means by which the calculating machine which offers the supposed storage region sends out a message to each storage system connected to the computer system

[0009]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail. In addition, a "store system" presupposes below that it is language including both sides with the aggregate of the store of the simple substance represented by the disk unit, two or more stores represented by the aggregate and RAID of JBOD, and the control unit of those.

[0010] Drawing 1 is drawing showing the configuration of 1 operation gestalt of the computing system which applied this invention. A computer system has the calculating machine (following "administration terminal") 800 for the calculating machine (following "server") 100 which manages the information on supposition, the calculating machine (following "host") 200 which uses storage, the storage systems 300A and 300B, the backup-memory system 500, and a user to manage a computer system

[0011] The management server 100, a host 200, the store systems 300A and 300B, the backup memory 500, and the administration terminal 800 are connected in the network 700. Internet Protocol (IP) is raised as an example of the protocol used in a network 700, and specification. In addition, each equipment connected in the network 700 is equipped with the interface (connection) for connecting with a network 700.

[0012] On the other hand, a server 100, a host 200, the store systems 300A and 300B, the backup-memory system 500, and the administration

terminal 800 are connected by Storage Area Network (SAN) 600 which is a transfer way for data transfer. As an example of the protocol used by SAN600, and specification, they are a fiber channel (FC), IP, and Infini. There is Band (trademark). In addition, each equipment connected by SAN600 has an interface (connection) for connecting with SAN600.

[0013] A server 100 has a processor and memory (not shown). The virtual volume information 110, the physical volume information 120, mapping information 130, and the pair status information 140 are stored in memory. The storage region ("physical volume" is called hereafter) which the store system 300 offers to external equipment, and management information including the correspondence information on virtual volume are stored in mapping information 130. In addition, about other information, it mentions later.

[0014] Furthermore, a server 100 has the volume multiplexing program 150 in memory. When the store system 300 does not have the duplicate function of physical volume, the volume multiplexing program 150 is a program performed by the processor, in order to reproduce the physical volume which the store system 300 offers through SAN600 with directions of a server 100.

[0015] A host 200 has a processor and memory (not shown). Application software 210, OS220, and the access processing software 230 are stored in memory. Middleware, such as backup software and database management software (DBMS), is also contained in application software 210. Moreover, a file system, a device driver, etc. are contained in the access processing software 230.

[0016] The store system 300 performs record/playback of the data which a host 200 uses according to a demand of a server 100 or a host 200. The store system 300 has a control section 310 and a disk unit 350. Moreover, the store system 300 provides a server 100 or a host 200 with

the storage region which the disk unit 350 which a store system has has as physical volume 400.

[0017] In addition, if "physical volume" may correspond to the physical storage region and one to one of a disk unit which the store system 300 has, it may be in agreement with the logical memory field which is the store system 300 interior and is further supposed like LU (Logical Unit) which a RAID system has. However, in the following explanation, "physical volume" does not distinguish especially the logical memory field or physical storage region that the storage system 300 has.

[0018] The control section 310 of store system 300A has the internal volume multiplexing program 320 and the external volume multiplexing program 330 in memory (not shown). The internal volume multiplexing program 320 is a program for realizing the snap shot dump function which carried out point **. According to the directions from a server 100, a host 200, or an administration terminal 800, specifically, the internal volume multiplexing program 320 is performed, in case the duplicate of the physical volume inside store system 300A is created in other physical volumes inside store system 300A.

[0019] On the other hand, the external volume multiplexing program 330 is a program for realizing the remote copy function which carried out point **. According to the directions from a server 100, a host 200, or an administration terminal 800, specifically, the external volume multiplexing program 330 is performed, in case the duplicate of the physical volume inside store system 300A is created in the physical volume of the store system 300A exterior. Moreover, in this operation gestalt, store system 300B presupposes that it does not have the internal volume multiplexing program 320 and the external volume multiplexing program 330.

[0020] The backup- memory system 500 is a store system for storing the

duplicate of the data stored in the store systems 300A and 300B. In the backup- memory system 500, a tape unit, tape- library equipment, a magnetic disk drive, or optical- magnetic disc equipment is used as a storage.

[0021] An administration terminal 800 is used in order that a user may acquire or set up the various information which a server 100 holds. Specifically, a user can set up the various information which a server 100 holds through a network 700 or SAN600 using an administration terminal 800.

[0022] A user can perform directions of creation of virtual volume, a setup, deletion, matching with virtual volume and the physical volume 400, creation of a virtual volume pair, a setup, deletion, etc. to a server 100 by setting up such information.

[0023] The control section 310 and administration terminal 800 of a server 100, a host 200, and the storage system 300 are omitted in this Fig, although it has CPU, memory, etc. which perform software and a program.

[0024] In the following explanation, with this computer system, the physical volume 400 which the store systems 300A and 300B offer is supposed by the server 100, and presupposes that it is the environment with which a host 200 is provided as virtual volume.

[0025] Drawing 2 is a flow chart with which a host 200 shows the procedure at the time of accessing virtual volume (read/write). The application software 210 performed by the host 200 transmits the access request which specified the access range on virtual volume and virtual volume to OS220 currently performed by the host 200. The data which should be written in are also contained in the access request when access is a light demand (1001).

[0026] OS220 which received the access request is accessed through

SAN600 at the virtual volume which a server 100 offers. Specifically, a host 200 transmits the information (address range of virtual volume) which shows the access range of the virtual volume contained in an access request to a server 100 through SAN600. Under the present circumstances, if an access request is a light demand, the data which should be written in will also be transmitted together (1002).

[0027] The server 100 which received access from the host 200 specifies the virtual volume for access using the information (parameter) and the virtual volume information 110 which are included in access. World Wide Name (WWN) and a logical unit number (LUN) are contained in the information and the concrete target which specifically show the address of the equipment connected to SAN corresponding to virtual volume to access from a host 100. A server 100 searches the virtual volume corresponding to such information from the virtual volume information 110.

[0028] In addition, WWN currently assigned to virtual volume is the imagination address, and does not correspond with the physical equipment connected to SAN. Therefore, in practice, a server 100 judges the imagination address included in the command which is flowing on SAN to be the address corresponding to virtual volume, and answers the command concerned (1003).

[0029] Next, a server 100 pinpoints the field of the physical volume 400 corresponding to the address range of the virtual volume demanded by access using mapping information 130 (1004).

[0030] Then, a server 100 accesses the storage system 300 which has the field of the address on SAN600 of the specified physical volume 400, and the physical volume 400 which specifically specified the combination of WWN and LUN (1005) and was specified through SAN600 using the physical volume information 120 (1006). Here, "access" means read-out

or the writing of data.

[0031] The server 100 which ended access with the store system 300 which has the specified physical volume 400 reports the write-in completion report of an access result, for example, the read data, or data etc. to a host 200 (1007).

[0032] OS220 currently performed by the host 200 will report an access result to the application software 210 which required access, if an access result is received from a server 100 (1008). In the processing shown in drawing 2, between a host 200 and servers 100 and between a server 100 and the storage system 300 are transmitted the lead data or light data accompanying access through SAN600.

[0033] Drawing 2 at the time of a host 200 accessing drawing 3 at virtual volume (read/write) is a flow chart which shows a different procedure. The application software 210 performed by the host 200 transmits the access request containing the address range of virtual volume and virtual volume to OS220 (1101).

[0034] OS220 which received the access request requires access to virtual volume of the server access processing software 230 performed by the host 200 (1102). The access processing software 230 which received the demand asks a server 100 the location of the store system 300 which has the range of the physical volume corresponding to the address range of virtual volume, and the physical volume specifically corresponding to the address range of virtual volume, and the physical volume in the store system 300 through a network 700 or SAN600 (1103).

[0035] The server 100 which received the inquiry specifies the virtual volume for access using the address range and the virtual volume information 110 of virtual volume which are included in an inquiry. Since the specific approach is the same as the approach in drawing 2, explanation is omitted here (1104). Then, a server 100 pinpoints the

location of the field of the physical volume 400 corresponding to the address range of the virtual volume which received the inquiry, the store system 300 which specifically has corresponding physical volume, and the physical volume in the store system 300 using mapping information 130 (1105). Furthermore, a server 100 specifies the address on SAN600 of the specified physical volume 400 using the physical volume information 120 (1106).

[0036] Then, a server 100 transmits the address on SAN600 of the physical volume specified as the host 200 who is a reference through a network 700 or SAN600 (1107). The access processing software 230 performed by the host 200 accesses the storage system 300 which has the target physical volume 400 through SAN600 using the address on SAN600 of the physical volume transmitted from the server 100. Specifically, a host 200 accesses to the specific storage system 300 based on the address on obtained SAN600 (1108).

[0037] The access processing software 230 which ended access with the storage system 300 reports the read result of access, for example, the data, and the write-in completion report to OS220 (1109). OS220 reports an access result to the application software 210 which required access (1110). In the above-mentioned processing, lead data or light data is transmitted through SAN600 between a host 200 and storage 300.

[0038] By processing shown in drawing 2 or drawing 3, a server 100 supposes the physical volume 400 which the store systems 300A and 300B offer, and provides a host 200 with virtual volume. Moreover, a host 200 can access the storage system 300 only for the information on virtual volume, without taking the physical volume of a computer system into consideration.

[0039] In addition, although [the processing mentioned above / application software 210] the address range of virtual volume is

specified, application software 210 may specify the file name for access, and OS220 or the access processing software 230 may ask for the address range of virtual volume from the specified file name.

[0040] Drawing 4 is drawing showing an example of the virtual volume information 110. Virtual volume, the information for specifying virtual volume on SAN, and the information that specifically shows the correspondence relation between WWN, LUN, etc. are stored in the virtual volume information 110.

[0041] A virtual volume number is a number which shows the virtual volume which the server 100 offers. The SAN address shows the address on SAN600 assigned to virtual volume. As an example of the SAN address, there is information which specifies the volume in FC(s) and IP, such as combination of WWN and LUN and combination of an IP address and a MAC Address, or an iSCSI protocol.

[0042] Drawing 5 is drawing showing an example of the physical volume information 120. The physical volume information 120 is the table on which the information about the physical volume which the store system 300 offers was registered.

[0043] The device number is a number which shows the storage systems 300A and 300B which can use a server 100. In this Fig., the storage systems 300A and 1 correspond [0] to storage system 300B. A physical volume number is a number which can use a server 100 and which shows the physical volume 400 which the store systems 300A and 300B have.

[0044] The SAN address shows the address on SAN600 of the physical volume 400. A vendor name shows the vendor name which produced the store system 300. A model name shows the model name of the storage system 300. A serial number shows the serial number given to the storage system 300. A version number is a number which shows the version number in the model name of the store system 300.

[0045] A condition shows the condition of the physical volume 400. As an example of a condition, there are intact ["intact"] "during use", "prohibition of access", a "failure", etc. "During use", corresponding physical volume stores the data which a host 200 uses, and it is shown from a server 100 or a host 200 that it is in an accessible condition. It is shown that it is in the condition which the physical volume to which "it is intact" corresponds does not store the data which a host 200 uses, but can be assigned to virtual volume.

[0046] "Prohibition of access" shows that corresponding physical volume is in the condition that access from a server 100 or a host 200 is forbidden. For example, in case processing which reproduces the data stored in a certain physical volume is performed, the condition of having forbidden access to that physical volume temporarily is equivalent to this condition. It is shown that a "failure" is in the condition which a failure cannot generate and use for corresponding physical volume.

[0047] A server 100 is what (it calls "taking a synchronization" below) the control section 310 and information on each storage system 300 are exchanged for, and updates the contents of each condition registered into the physical volume information 120.

[0048] An internal volume multiplexing function is information the store system 300 which has the corresponding physical volume 400 indicates it to be whether it has the internal volume multiplexing program 320. An external volume multiplexing function is information the store system 300 which has the corresponding physical volume 400 indicates it to be whether it has the external volume multiplexing program 330.

[0049] In the example of drawing 5, the store system of the device number 0, i.e., store system 300A, has the internal volume multiplexing program 320 and the external volume multiplexing program 330, and the store system of the device number 1, i.e., store system 300B, does not

have both the internal volume multiplexing program and the external volume multiplexing program.

[0050] In addition, although this operation gestalt does not show, there may also be a storage system 300 which has only the internal volume multiplexing program 320 or program of external volume multiplexing program 330 either one of the two. Moreover, even if the store system 300 has the internal volume multiplexing program 320 grade, those programs cannot apply to such physical volumes 400 by the configuration of the physical volume 400 which the store system 300 has. Therefore, the existence (or propriety of application) of internal volume multiplexing program 320 grade is managed every physical volume 400. However, the existence of these programs may be managed every storage system 300.

[0051] As an approach a server 100 acquires the information which shows the attribute of the storage system 300 from the storage system 300, it is the SCSI INQUIRY command and SCSI MODE. The information acquisition using the SENSE command can be considered.

[0052] However, although one or more storage systems 300 may exist in this computing system, each storage system 300 is not necessarily equipment of the isomorphism of this vendor of the same kind, or this version. In this case, the internal volume multiplexing program 320 and the external volume multiplexing program 330 are scatteringly mounted in the storage system 300 for every vendor. Therefore, a server 100 is the approach of one information acquisition, and can acquire [no] information on the existence of internal volume multiplexing program 320 grade from the store systems 300 connected to SAN600.

[0053] Then, a manager sets up the information on the existence of this internal volume multiplexing program 320 grade manually through a host 200 or an administration terminal 800 in this case. Or a server 100 holds

beforehand by using as a table the list of the functions which the store system 300 specified by a vendor name, a model name, a serial number, and the version number has. And when a server 100 compares with its table the information acquired by the INQUIRY command etc., it is also considered that a server 100 sets up automatically the information on the existence of internal volume multiplexing program 320 grade.

[0054] Drawing 6 is drawing showing an example of mapping information 130. Mapping information 130 is the table on which the detailed information of the correspondence relation between virtual volume and the physical volume 400 was registered.

[0055] A virtual volume number is a number which shows the virtual volume which the server 100 offers. This virtual volume number supports the virtual volume number of the virtual volume information 110. Virtual volume size shows the magnitude of virtual volume. The number of physical volumes shows the number of the physical volumes 400 which constitute virtual volume.

[0056] Connection sequence is information which shows the sequence of the physical volume 400 which constitutes virtual volume. Connection sequence is a number which begins from 1 and increases every [1], and the storage region of the physical volume 400 is connected according to the number of connection sequence, and, specifically, constitutes one virtual volume. The device number is a number which shows the storage system 300 containing the corresponding physical volume 400. This device number is equivalent to the device number of the physical volume information 120.

[0057] A physical volume number is a number which shows the physical volume 400, and supports the physical volume number of the physical volume information 120. The physical volume range shows the range assigned to corresponding virtual volume within the physical volume 400.

A multiplexing attribute is information which shows an attribute when corresponding virtual volume is related to whether to be related to multiplexing of volume. Specifically, the information which shows distinction of whether corresponding virtual volume is the virtual volume of a copy place or to be the virtual volume of a copied material is included in a multiplexing attribute.

[0058] Drawing 7 is drawing showing an example of the pair status information 140. The pair status information 140 is a table on which the information which shows the relation between the pair at the time of data duplicates, such as a snap shot dump, being performed, i.e., the virtual volume of a reproducing agency, and the virtual volume of a duplicate place is registered.

[0059] A pair number is a number which shows the pair (a "virtual volume pair" is called below) of the copy place virtual volume which a server 100 manages, and copied material virtual volume. As shown in this Fig, plural is sufficient as copy place virtual volume for copied material virtual volume at one. Copied material volume shows the virtual volume number of copied material virtual volume. Copy place volume shows the virtual volume number of copy place virtual volume.

[0060] Next, the processing which forms the duplicate of virtual volume is explained. The duplicate of the physical volume 400 is created by the internal volume multiplexing program 320 of store system 300A, or the external volume multiplexing program 330 about the physical volume 400 which specifically belongs to store system 300A among the physical volumes 400 corresponding to the virtual volume specified as an object of a duplicate by the directions of a server 100 based on directions of host 200 grade. On the other hand, the duplicate of the physical volume 400 is created by activation of the volume multiplexing program 150 of a server 100 about the physical volume 400 belonging to store system

300B. This example is explained. In addition, all processings explained henceforth are the processings which can be performed on the both sides of the system explained by drawing 2 and drawing 3.

[0061] As shown in drawing 6, the virtual volume (virtual volume 0) with the virtual volume number 0 which is the copy origin of the pair number 0 consists of physical volume (physical volume 0_0) independent with the physical volume number 0 belonging to store system 300A. Store system 300A which has the physical volume 0_0 has the internal volume multiplexing program 320 and the external volume multiplexing program 330, and it is possible to apply these programs to the physical volume 0_0.

[0062] As shown in drawing 7, the copy place volume of the pair number 0 is two, the virtual volume 100 and the virtual volume 101. Among this, the virtual volume 100 consists of physical volumes 0_10 belonging to store system 300A. That is, the copied material physical volume 0_0 and the copy place physical volume 0_10 are in the same storage system 300A. Therefore, the copy of data from the physical volume 0_0 to the physical volume 0_10, i.e., a snap shot dump, is performed by the internal volume multiplexing program 320.

[0063] In this case, a server 100 should just direct the copy of data from the physical volume 0_0 to the physical volume 0_10 to store system 300A. Store system 300A reports termination of a copy to a server 100 after copy termination.

[0064] On the other hand, the virtual volume 101 consists of physical volumes 1_13 belonging to store system 300B. That is, the copied material physical volume 0_0 and the copy place physical volume 1_13 exist in a different storage system 300. However, it is in the environment which can apply the external volume multiplexing program 330 to the physical volume 0_0. For this reason, store system 300A performs using

the external volume multiplexing program 330, the copy of data, i.e., the remote copy, from the physical volume 0_0 to the physical volume 1_13. [0065] In this case, a server 100 should just direct the copy to the physical volume [volume / 0_0 / physical] 1_13 of other store system 300B to store system 300A. Store system 300A which received directions is performing the external volume multiplexing program 330, and transmits the information on the physical volume of the data which should be copied to store system 300B, and a copy place (address etc.) via SAN600.

[0066] Storage system 300B used as a copy place is stored in the physical volume which had transmitted data specified based on the information on the physical volume of the copy place transmitted from storage system 300A.

[0067] About each physical volume, when the virtual volume of a copied material consists of two or more physical volumes, if the internal volume multiplexing program 320 and the external volume multiplexing program 330 are applicable, respectively, the duplicate of each physical volume is created based on the internal volume multiplexing program 320 and the external volume multiplexing program 330, and the duplicate of virtual volume can be formed by the connection.

[0068] Next, the store system 300 explains the case where it does not have the internal volume multiplexing program 320 grade. As shown in drawing 6, the virtual volume 1 which is the copy origin of the pair number 1 consists of physical volumes 1_0 belonging to store system 300B. Store system 300B which has the physical volume 1_0 does not have the internal volume multiplexing program 320 and the external volume multiplexing program 330.

[0069] As shown in drawing 7, the copy place volume of the pair number 1 is the virtual volume 102, and according to drawing 6, the virtual

volume 102 consists of physical volumes 1_10 which store system 300B has. That is, the storage system 300B itself cannot perform the copy of data from the copied material physical volume 1_0 to the copy place physical volume 1_10.

[0070] In this case, the volume multiplexing program 150 in a server 100 performs the copy of data from the copied material physical volume 1_0 to the copy place physical volume 1_10. A server 100 reads the data in the physical volume 1_0 to a server 100 via SAN600, and, specifically, writes in the physical volume 1_10 via SAN600.

[0071] Next, the case where virtual volume is constituted by connection of the physical volume which two or more store systems offer is explained. As shown in drawing 6, the virtual volume 2 which is the copy origin of the pair number 2 is constituted by connection in the physical volume 0_2 belonging to store system 300A, and the physical volume 1_2 belonging to store system 300B.

[0072] Here, although the internal volume multiplexing program 320 is applicable to the physical volume 0_2 as shown in drawing 5, the internal volume multiplexing program 320 is unapplicable ability at the physical volume 1_2. Moreover, as shown in drawing 7, the copy place volume of the pair number 2 is the virtual volume 103. According to drawing 6, the virtual volume 103 consists of physical volume 0_12 which store system 300A has, and physical volume 1_12 which store system 300B has.

[0073] In this case, the copy of data from the physical volume 0_2 to the physical volume 0_12 is performed by the internal volume multiplexing program 320 in store system 300A. On the other hand, the copy of data from the physical volume 1_2 to the physical volume 1_12 is performed by the volume multiplexing program 150 in a server 100. After both copies of data are completed, a server 100 connects copy place physical volume, and completes formation for the virtual volume 103 as a

duplicate of the virtual volume 2

[0074] Next, creation of virtual volume, duplicate creation (multiplexing) of virtual volume, the pair condition dissolution (multiplexing discharge) of virtual volume, and deletion of virtual volume are explained.

[0075] Drawing 8 is the flow chart which showed the procedure with which a server 100 creates virtual volume. Beforehand, with the SCSI INQUIRY command, the SCSI MODESENSE command, etc., a server 100 acquires the information on the store systems 300A and 300B which exist on SAN600, and the information on the physical volume 400 belonging to them, and creates or updates the physical volume information 120. It sets up by approach which was described above about the existence of an internal volume multiplexing program and an external volume multiplexing program (1201).

[0076] A server 100 receives the creation demand of virtual volume, and the size of virtual volume from a host 200 or an administration terminal 800 (1202). A server 100 extracts after that the physical volume whose condition is "intact" from the physical volume information 120 (1203). Then, a server 100 is combined so that it may become the size of which the extracted physical volume was required, and it creates one virtual volume. A server 100 registers the information about the virtual volume into mapping information 130 (1204).

[0077] A server 100 "updates while in use" the condition column of the physical volume information 120 of the physical volume used as virtual volume (1205). A server 100 assigns the address on SAN to virtual volume, registers to the virtual volume information 110 (1206), and reports the SAN address assigned to the host 200 or the administration terminal 800 (1207).

[0078] Drawing 9 is a flow chart which shows the procedure with which a server 100 creates the duplicate of virtual volume newly. A server 100

receives creation directions of the duplicate of a certain virtual volume from a host 200 or an administration terminal 800 (1301). The server 100 which received creation directions performs the above-mentioned virtual volume creation processing, and creates the virtual volume of the same size as a copied material (1302).

[0079] Then, a server 100 copies the data of copied material virtual volume to copy place virtual volume based on the approach mentioned above. Directions of a copy are taken out to the store system 300 of a copied material, or, specifically, server 100 self reproduces the data between the store systems in the store system 300 (1303).

[0080] Then, a server 100 registers the pair of new virtual volume to the pair status information 140 (1304), and updates the multiplexing attribute of mapping information 130 (1305). After updating is completed, a server 100 reports termination of a copy of data to a host 200 or an administration terminal 800 (1306).

[0081] The contents of virtual volume which serve as a pair at this time completely become the same thing. Moreover, when the internal volume multiplexing program 320 or the external volume multiplexing program 330 can be applied to the copied material physical volume corresponding to [when the write request of data occurs from a host 200 to copied material virtual volume] copied material virtual volume, the store system 300 reflects renewal of data to copy place physical volume using the function.

[0082] On the other hand, when an above-mentioned function cannot be used, a server 100 uses the volume multiplexing program 150 in a server, and writes in the same data also to the applicable part of copy place virtual volume. As long as it is in a pair condition, it is made for a server 100 to become the same [the contents of the virtual volume of a pair] by these processings.

[0083] The server 100 which received write- in directions of the data to the store system 300 checks whether a pair exists in the virtual volume in which the existence and the writing of a function of the store system 300, such as a data copy, were directed, and, specifically, checks whether it is necessary to use the volume multiplexing program 150 of a server 100. Then, a server 100 performs a copy of data using the volume multiplexing program 150 of a server 100, takes out directions of a copy of data to the store system 300, or performs one of processings.

[0084] Drawing 10 is the flow chart which showed the procedure with which a server 100 cancels the pair condition of virtual volume. A server 100 receives dissolution directions of the pair condition over a certain virtual volume pair from a host 200 or an administration terminal 800 (1401). The server 100 which received dissolution directions deletes the information on the pair which corresponds from the pair status information 140 (1402), and updates the multiplexing attribute of mapping information 130 (1403). Then, a server 100 reports termination of pair condition dissolution processing to a host 200 or an administration terminal 800 (1404).

[0085] Here, the virtual volume which was copy place virtual volume serves as a static image copy (snap shot dump copy) of the copied material virtual volume at the time of canceling a pair condition. A computer system can use this snap shot dump copy for backup etc.

[0086] Drawing 11 is the flow chart which showed the procedure with which a server 100 deletes virtual volume. A server 100 receives the deletion directions to a certain virtual volume from a host 200 or an administration terminal 800 (1501). The server 100 which received deletion directions specifies the physical volume which constitutes the virtual volume which corresponds from mapping information 130 (1502).

[0087] Then, a server 100 changes the condition of the physical volume

information 120 corresponding to the specified physical volume into "it is intact" (1503), and deletes the information on the virtual volume which corresponds from mapping information 130 (1504). Furthermore, a server 100 deletes the information on the virtual volume which corresponds from the virtual volume information 110, and opens the SAN address (1505). The server 100 which finished these processings reports termination of virtual volume deletion to a host 200 or an administration terminal 800 (1506).

[0088] In this computer system, in taking the backup in the time of there being virtual volume, it takes the following procedures. First, in a computer system, the duplicate of the virtual volume which wants to backup is created and the pair condition dissolution of virtual volume is processed after that. Then, the reproduced copy place virtual volume becomes the snap shot dump of the copied material virtual volume in the time of processing of a pair condition dissolution being performed. In this condition, a computer system backs up data to a backup- memory system from the virtual volume which was a copy place. If such processing is performed, it can back up to this computer system, without being influenced by renewal of the virtual volume which is a copied material etc.

[0089] In addition, also in processing of this backup, if application of the external volume multiplexing program 330 is possible in the physical volume which constitutes virtual volume, that function will be used and the volume multiplexing program 150 in a server 100 will be performed about the physical volume which is unapplicable ability.

[0090] In this operation gestalt, when creating a pair condition again after backup acquisition with a computer system, it is possible to recopy all data like duplicate creation of virtual volume simply. however -- in addition, the update information to the copied material virtual volume of

the period when the pair condition is canceled -- difference -- the difference of re-**** which considers as data, records by the server 100, and creates a pair condition again -- there is also a method of copying only data to copy place virtual volume. Moreover, the approach of expressing with a bit map the location where data were updated etc. can be used.

[0091] When the store which has a snap shot dump function and a remote copy function, and the store which it does not have are intermingled in the computing system which realizes the bar tea RIZESHON environment where virtual volume is treated according to this operation gestalt, it becomes that it is possible in creating the duplicate of virtual volume efficiently by using it for it, if application of the volume multiplexing program of a store system is possible in the physical volume which constitutes virtual volume, and using the volume multiplexing program by the side of a server, if it is unapplicable ability.

[0092] Moreover, the snap shot dump of virtual volume can be efficiently taken by creation of the above-mentioned duplicate, and acquisition of backup of the data stored in virtual volume also becomes easy.

[0093] In addition, in this invention, it is possible for the virtual volume of a copy place not to restrict that it is one, but to have two or more copy place virtual volumes. For example, supposing there is a store system which has the external volume multiplexing program which performs the control which creates only the virtual volume which is one copy place and two or more virtual volumes of a copy place are set up, the remaining copy place virtual volumes are performing the volume multiplexing program a server's has, and a computer system will perform the copy of two or more virtual volumes using the external volume multiplexing program which a store system has in one of copy place virtual volumes. By this, the function which a storage system has can be

used without futility.

[0094] In addition, in this operation gestalt, a server 100 holds correspondence relation with the information which shows the address on SAN corresponding to a virtual volume number and virtual volume as virtual volume information 110, and uses the virtual volume number for the information which shows the correspondence relation between virtual volume and physical volume. However, use of a virtual volume number may be omitted and the address on SAN corresponding to virtual volume may be directly used for the information which shows the correspondence relation between virtual volume and physical volume.

[0095] In this operation gestalt, the size of the pair of virtual volume of the storage region of each physical volumes which constitute virtual volume does not need to correspond just in agreement [the size of the storage region of each pairs].

[0096] With this operation gestalt, the volume multiplexing program 150 was established on the server 100, and the form where the function without this function of storage system 300B was compensated was explained. Like this, a server 100 has a software RAID program, when the store system without a hardware RAID function like JBOD is connected to SAN600, the software RAID function by the side of a server 100 can be used, and the storage region in JBOD can also be RAID-ized. By this, a server 100 can conceal the difference in the function of various storage systems, and can provide a user with it as a single storage system

[0097]

[Effect of the Invention] According to this invention, in the computing system which supposes the storage region where the storage system by which engine performance differs is intermingled, the computing system

which reproduces the supposed storage region, and the creation approach of a duplicate can be offered.

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.

2**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram of the computing system in the gestalt of operation of this invention.

[Drawing 2] It is the flow chart with which a host shows the procedure which accesses virtual volume.

[Drawing 3] It is the flow chart with which a host shows the procedure which accesses virtual volume.

[Drawing 4] It is drawing showing an example of the virtual volume information 110.

[Drawing 5] It is drawing showing an example of the physical volume information 120.

[Drawing 6] It is drawing showing an example of mapping information 130.

[Drawing 7] It is drawing showing an example of the pair status information 140.

[Drawing 8] It is the flow chart which shows the procedure which

creates virtual volume.

[Drawing 9] It is the flow chart which shows the procedure which creates the duplicate of virtual volume.

[Drawing 10] It is the flow chart which shows the procedure of a virtual volume pair dissolution.

[Drawing 11] It is the flow chart which shows the procedure of virtual volume pair deletion.

[Description of Notations]

100 [-- A physical volume, 500 / -- A backup memory, 600 / -- SAN, 700 / -- A network, 800 / -- Administration terminal.] -- A server, 200 -- A host, 300 -- A store, 400
